CHARGE NUMBER: 0108

PROGRAM TITLE: MECHANISM FOR SMOKE FORMATION

PERIOD COVERED: April 1 - April 30, 1973

PROJECT LEADER: W. R. Johnson

DATE OF REPORT: May 8, 1973

I. THE POLYMERIZATION OF L-MENTHYL 1,1-DIMETHYL-4-PENTENYL CARBONATE [1,2,3]

L-menthyl 1,1-dimethyl-4-pentenyl carbonate was polymerized in bulk using benzoyl peroxide as the catalyst. The polymerization was carried out at 80°C for approximately 140 hours. Workup of the polymerization mixture yielded a transparent, sticky substance which, according to infrared analysis, contained only a slight amount of unsaturation. Elemental analysis yielded C,H, O values 72.45, 10.82 and 16.95 percent, the theoretical values being 72.93, 10.88 and 16.19 percent. The number average molecular weight as determined from vapor-phase osmometry was 1,240. The conversion of monomer to characterized polymer was 17%. For the time being, the polymerization of monomers prepared by Dr. E. Rundberg for the purpose of obtaining nonvolatile menthol precursors is terminated.

II. OXIDES OF NITROGEN IN CIGARETTE SMOKE[4,5]

Nitric oxide in the sidestream smoke was determined for several cigarettes. The results are given in Table 1. The data show that the Marlboro delivered more nitric oxide than did the other brands. For the most part, differences among cigarettes were not great. The similarities in delivery may be taken to be consequences of the fact that a great deal of the nitric oxide observed in the sidestream comes from organic nitrogen whose concentration in filler should not vary much from cigarette to cigarette.

Cigarettes made from 100% Schweitzer SBS sheet gave high nitric oxide deliveries per puff interval, but total deliveries were not materially different from the other cigarettes. Mainstream deliveries are not available at present.

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TABLE I

Cigarette	Puff No.	Sidestream Nitric Oxide Delivery (mg/cigt)
Kent	8	2.50
Winston	10	3.21
Viceroy	9	3.34
Marlboro	10	3.96
Schweitzer Cased (D2CUU)	5	2.46
Schweitzer Uncased (D2CUS)	4	3.26

Nitrous oxide enrichment data from a cigarette containing 1.8% $Ca(^{15}NO_3)_2$ (E1NX) shed light on the relative contributions of the organic nitrogen oxidation mechanism and the nitrate decomposition mechanism during the formation of the mainstream and sidestream smoke. The nitrogen-15 enrichments of the nitrate in the filler, and of the mainstream and sidestream smoke were 87, 88 and 65%. The contribution of the organic nitrogen oxidation is sufficiently small in the mainstream that no dilution of the nitrogen-15 originally in the nitrate of the filler was observed in the nitrous oxide. However, the enrichment in the sidestream dropped to 65%, indicating that non-labelled (and hence non-nitrate) sources contributed significantly to the formation of the nitrous oxide.

Paper cigarettes which contained $NaNO_3$ as the only nitrogen source were obtained from G. Keritsis. These cigarettes contained approximately 2-4% sodium nitrate and delivered 33 and 65 micrograms of mainstream nitrous oxide, respectively. Similar cigarettes which contained comparable amounts of nitrogen in the forms of glycine and Knox gelatine delivered 1-2 micrograms of nitrous oxide to the mainstream smoke. Again, the differences in the contributions of the two mechanisms are clearly demonstrated.

III. REFERENCES

1.	H. Grubbs	6252	33-54
2.	W. Johnson	4361	96-100
		6293	1
3.	M. Dodson	6283	16
4.	D. Powell	6097	47-52
5.	P. Chen	6183	60

/slb

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